YS-S4 MULTI ROTOR AUTOPILOT V1 USER MANUAL

PRODUCT DISCLAIMER

Multirotors may cause injury if used carelessly or improperly. Make sure you fly your aircraft in a safe, responsible manner. ZeroUAV shall not be liable for any damage, whether direct or indirect, resulting from the use of the YS-S4.

SAFETY ALWAYS FIRST

a) Before your first flight, please confirm your frame configuration is correct.

b) Observe the LED; 3 red flashing indicates normal working state. If you do not see the 3 red flashing, check your entire set up again.

c) For the safety reasons, the ESCs / motors will NOT arm if GPS module is unplugged, disconnected or was not plugged-in correctly. Check & re-plug the GPS module.

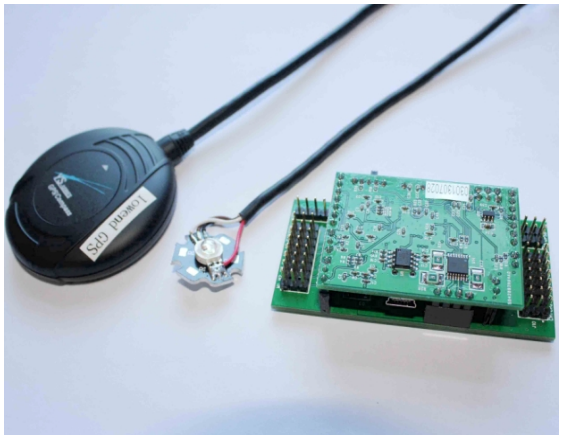
d) Always power up your RC Transmitter (Tx) before powering YS-S4 & power down your aircraft before turning OFF the Tx.

e) For parameter configuration & firmware upgrades, ALWAYS take off your propellers or disconnect your ESC power supply.

Technical Support – if you have any questions related to this product, please refer to the FAQ files downloaded from: http://www.zerouav.com, or email us at support@zerouav.com

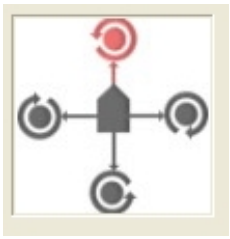
Component List –

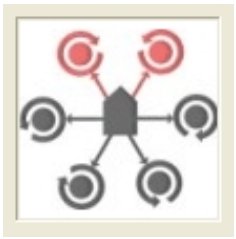
1) YS-S4 bare board
2) GPS module (includes Compass)
3) LED indicator,
4) Related cables (power cable & receiver cables)



MULTIROTOR FUNCTION

1) **Supported multirotor layouts:**





Quad X4, Quad +4, Hexa X6, Hexa +6.

2) **YS-S4 does not support baroque & near-baroque frames.**
3) **Upgradable – upload new flight firmware via mini USB or USB-COM cable.**
4) **Three working modes**
   i) **Stabilize flight**
   ii) **Auto hover**
   iii) **Return to home & land.**
5) **2 control methods: RC & Android mobile via WIFI module (sold separately).**
6) **Support parameter configuration via PC or Android mobile (via WIFI).**
7) **LED Light display's the mode, GPS lock & low power warning.**
8) **Standard safety features; motor arming protection, failsafe auto RTH & landing.**

PREREQUISITES

a) **RC Transmitter (Tx) & Receiver (Rx), 6 channels with two sets of 2-way switches.**

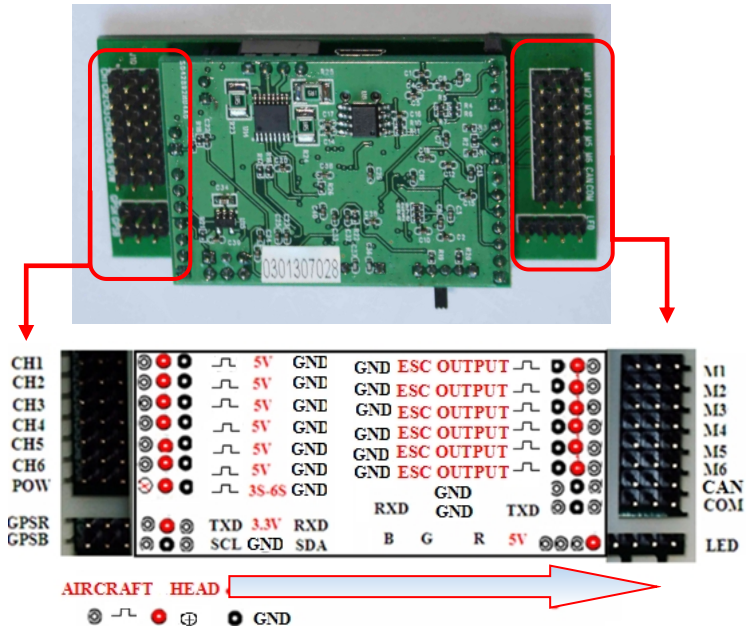
b) **The Rx should support failsafe (F/S) in all channels.**

c) **YS-S4 supports PWM ESC. Xaircraft (XA) ESC & IIC type ESCs are not supported.**

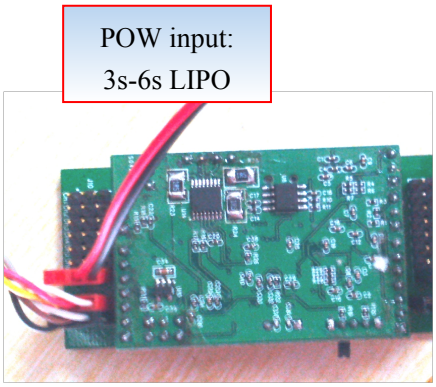
d) **The YS-S4 supports small to medium sized multirotors. The arm to arm frame distance less than 650mm & propellers should be smaller than 14 inches.**

e) **Use 3S-6S lipo battery as input power.**

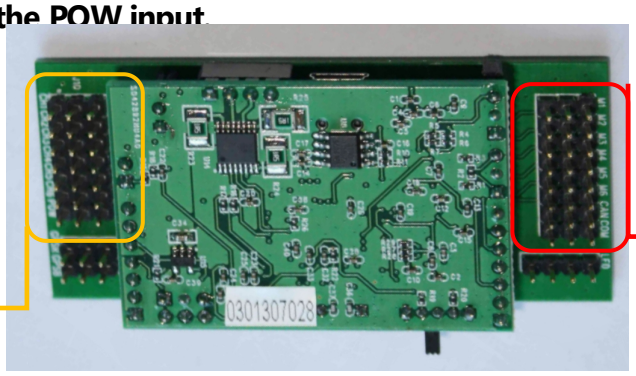
CONNECTION INTERFACE



POWER SUPPLY



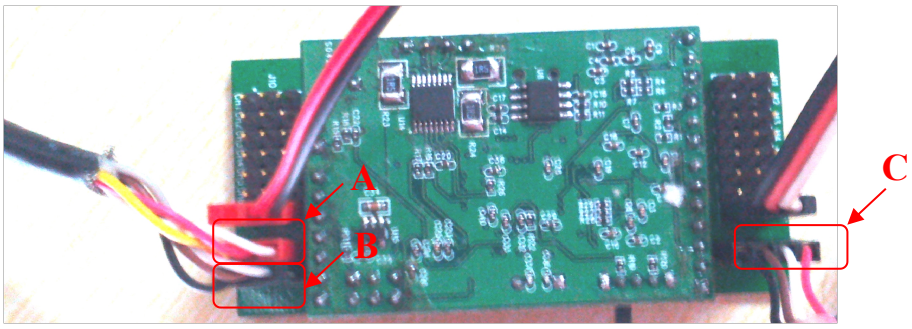
The YS-S4 has an integrated power manager. You can connect 3S to 6S lipo batteries directly to the module via the POW input.



Interface	Connect to:
CH1	AIL of Rx
CH2	ELE of Rx
CH3	THR of Rx
CH4	RUD of Rx
CH5	CH5 of Rx
CH6	CH6 of Rx
POW	3S-6S battery

Interface	Connect to:
M1	ESC of Motor1
M2	ESC of Motor2
M3	ESC of Motor3
M4	ESC of Motor4
M5	ESC of Motor5
M6	ESC of Motor6
CAN	Reserved

GPS Connection



GPSR	GPS port1 (Red terminal)	A	COM	To RS232 COM port of PC or WIFI module
GPSB	GPS port 2 (Black terminal)	B	LED signal	Signal to LED module
LED Module				
LED	4 Pins (Red wire outside)	C	LED	To LED module

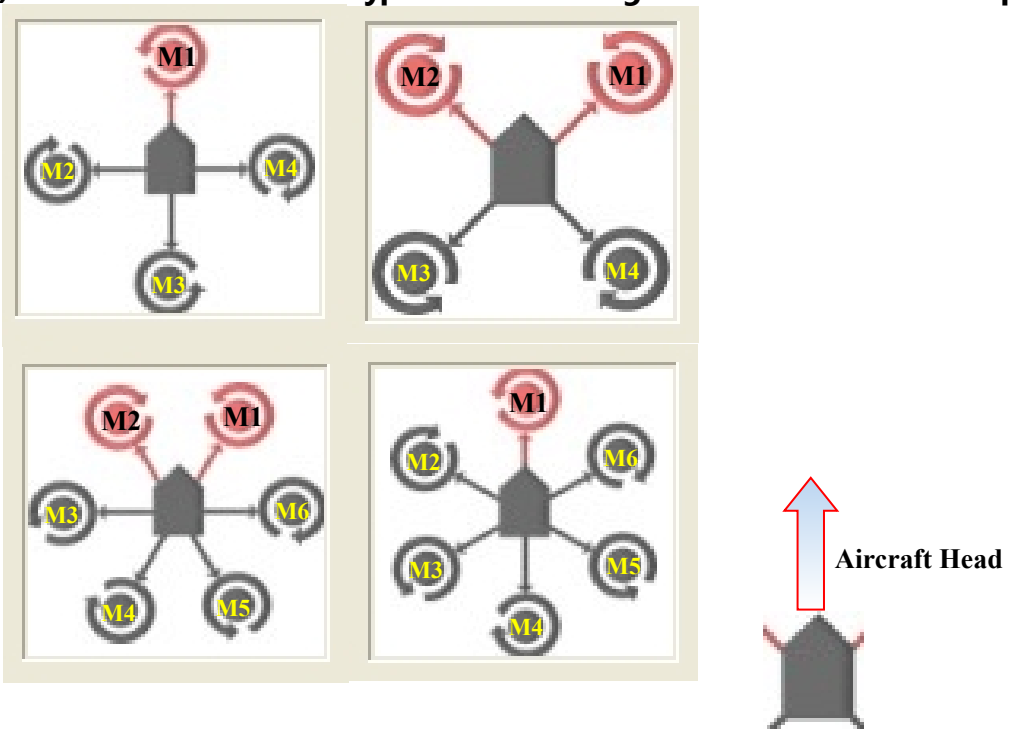
Warning: Your Rx is powered by YS-S4. DO NOT power Rx by any other supply or

YS-S4 may be damaged. If your ESC has a built in Internal BEC, remove the red wire.

HARDWARE INSTALLATION

1) Motor Arrangement & Propeller Direction:

a) Select the multirotor type via the configuration software. List supported



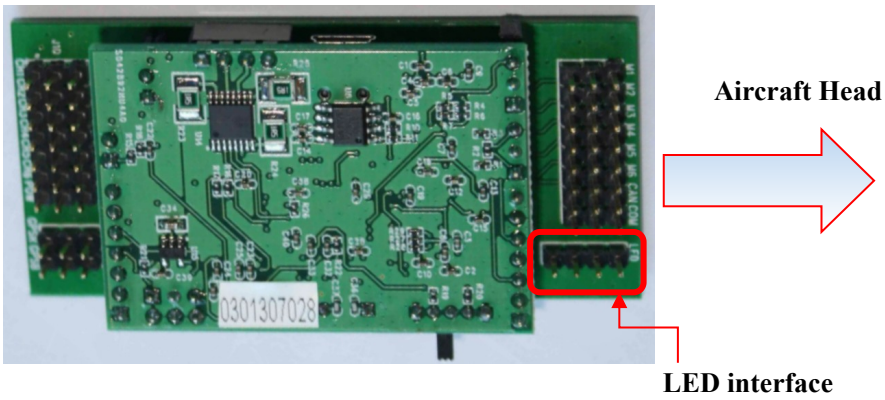
b) Note the M1 to M6 positions & propeller rotation direction.

2) YS-S4 Module Installation

a) The YS-S4 Module should be placed level on the main body of the aircraft.

b) For best results install at the Center of Gravity (CoG) of the aircraft.

c) The LED connector MUST point towards the head of the aircraft:



d) On small sized frames (motor to motor distance 450mm or less) ,the YS-S4 can be installed with double sided foam tape on the bottom.

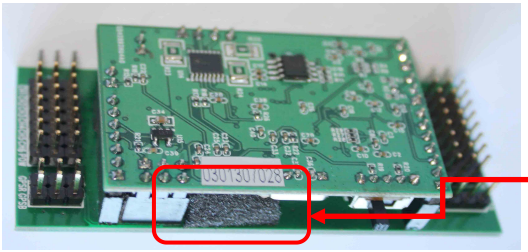
e) For medium sized frames (motor to motor 650mm), extra vibration damping mount is needed & reduce vibration as much as possible.

3) GPS Module Installation

a) The GPS module should be installed on a level GPS stand, which is higher than the electrical components on the aircraft. This ensures minimal magnetic field effect from the other component on-board, such as power cables, transmitters, camera, etc. Ensure that the arrow point towards the head of the aircraft.

Arrow towards aircraft head

4) Barometer



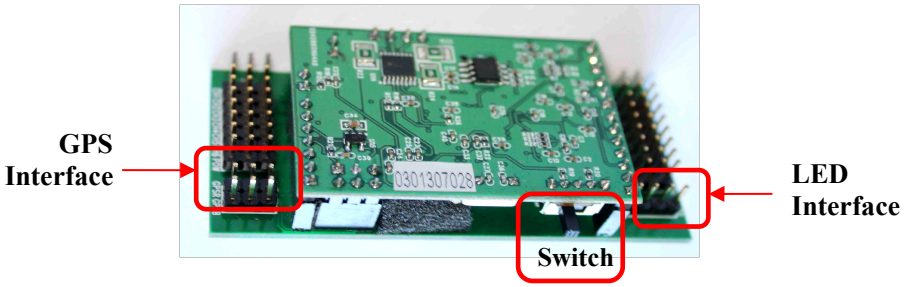
a) The YS-S4 has a sensitive barometer covered with a protective sponge (see above).

b) This sponge is important to ensure normal autopilot function. DO NOT remove it.

c) Should the sponge fall off due to wear & tear, reinstall with similar material.

FIRMWARE / FLIGHT SWITCH

a) Notice that there is a switch on the YS-S4 module (see below).



b) **Move the switch towards the GPS-Interface to enable Flying & Parameter Configuration.**

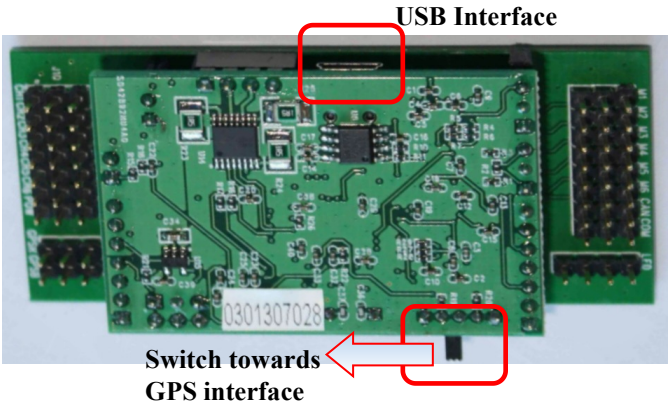
c) **Move the switch towards the LED-interface during firmware upgrade only. Normal flight cannot be achieved when the switch is in the firmware upgrade position.**

SETTING UP YOUR YS-S4 - PC CONFIGURATION

a) **Ensure that your GPS Module has been connected to the YS-S4 module. Configuration will not work if the GPS is not connected properly.**

b) **Ensure your Tx radio is ON, & the THR stick is at bottom & flight mode is in Stabilization mode.**

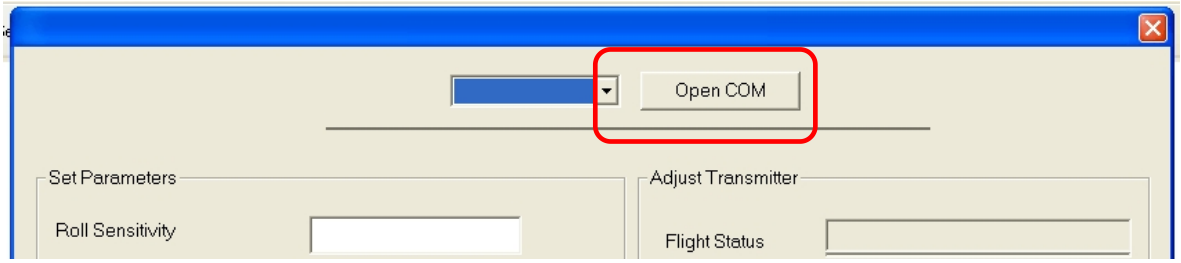
c) **Check & make sure the switch position is correct for Configuration & Flight:**



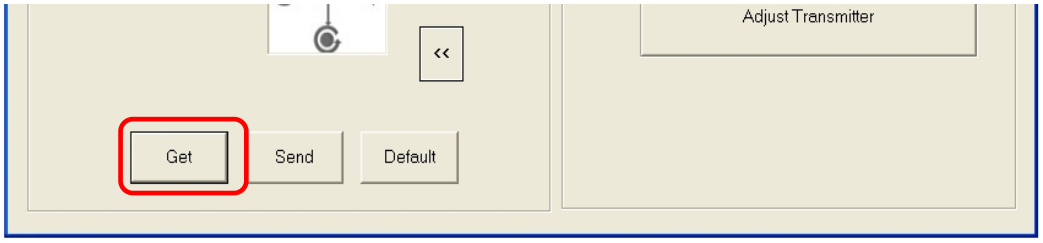
d) **Connect your YS-S4 module to your PC via the USB interface. Power up your YS-S4 with 3S - 6S lipo battery.**

e) **Your PC may show "find a new hardware" when using the USB cable for the first time. Use driver program in the 'Driver' folder in the root of the config software.**

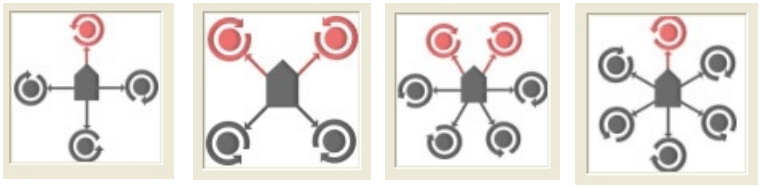
f) **Select the correct COM number & begin configuration by clicking 'Open COM':**



g) **Press 'Get' button to download your YS-S4 module current aircraft configuration.**



h) **Change the Aircraft Type according to your model:**



i) **The factory default parameters are good for normal flying in most models.**
j) **During test flights, it is recommended to keep the altitude limit & distance limit short. E.g. 30 meters (altitude) & 50 meters (distance), upon reaching these limits the aircraft will automatically RTH & land.**
k) **Set the 'Cell Num' according to your flight lipo cell numbers & 'Volt Alert Treshold' to 3.65. Select a smaller value when using an old battery, or select a bigger value when using new battery.**
l) **You may adjust the Roll Sensitivity & Sway Compensation according to your aircraft behavior during test flights. Range value is between 0 to maximum 255.**
m) **Sway Compensation: Hover & observe aircraft attitude. If it sways too much, then increase the Sway Compensation, till it is more stable. If the value is too high, you will observe oscillations. Reduce the value accordingly.**
n) **Roll/pitch Sensitivity: Fly it in a straight line, if the flight is not so stable, then increase the value. If the value is too big, the aircraft will oscillate on roll/pitch. Reduce the value accordingly.**
o) **Press 'Send' button to upload the newest parameters to the YS-S4.**
p) **To restore the default parameters, press 'Default' button.**

RADIO TRANSMITTER SETTING

1) **Select fixed wing model on your transmitter. Remove any channel mixing.**

2) **FUTABA Radio: All channels should be Normal (no reverse).**

3) **JR, JT & WFLY Radios: Reverse all channels.**

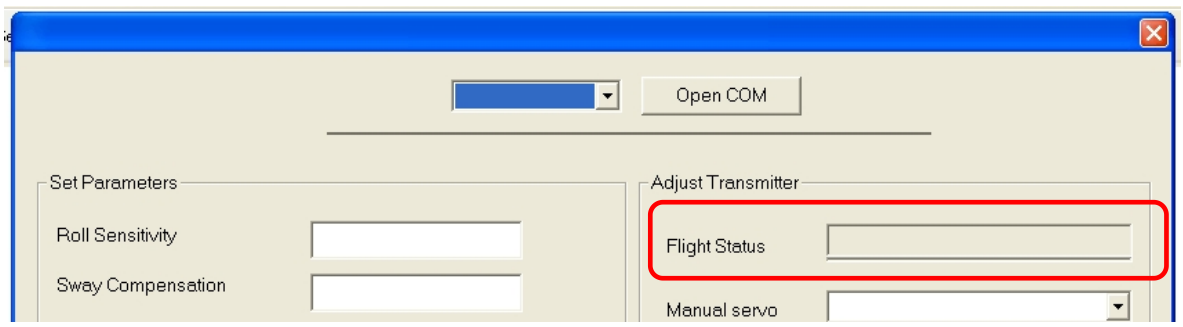
4) **Ensure your radio has two sets of two-way switches. Programme CH5 &**

CH6 to these switches to control the flight modes:

5) Adjust your two-way switch end points to control the flight modes:

CH5 POSITION	CH6 POSITION	FLIGHT MODE
CH5 Position 1	Any position	Stabilization
CH5 Position 2	CH6 Position 1	Auto hover
CH5 Position 2	CH6 Position 2	Return & Land

6) Check the changing Flight Modes via the Configuration software 'Flight Status':

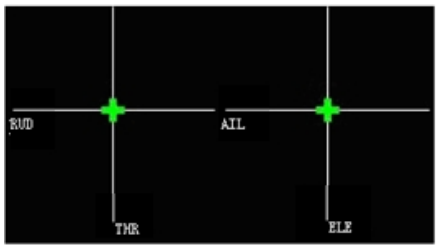


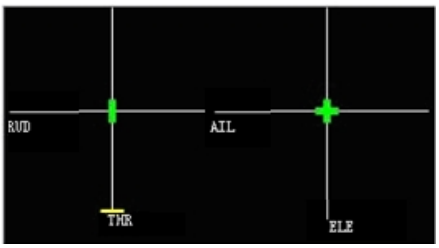
7) **FAILSAFE: Check with your Radio manual on how to set the Receiver failsafe. Ensure that when you OFF your radio, your failsafe settings are as follows:**

- **CH5 set to position 2**
- **CH6 set to position 2**
- **THR set 50% (mid point)**

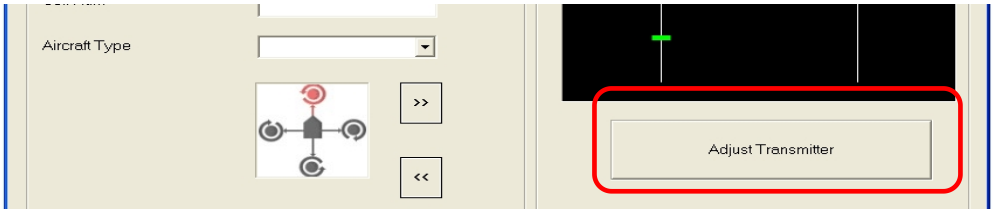
Confirm correct setting via the software display. When you turn OFF your transmitter, the display should read 'Return & Land'.

8) **Transmitter stick direction – check your THR, RUD, AIL & ELE stick movement are in the correct direction via the software display. If the directly is wrong, reverse the channel on your radio Tx:**

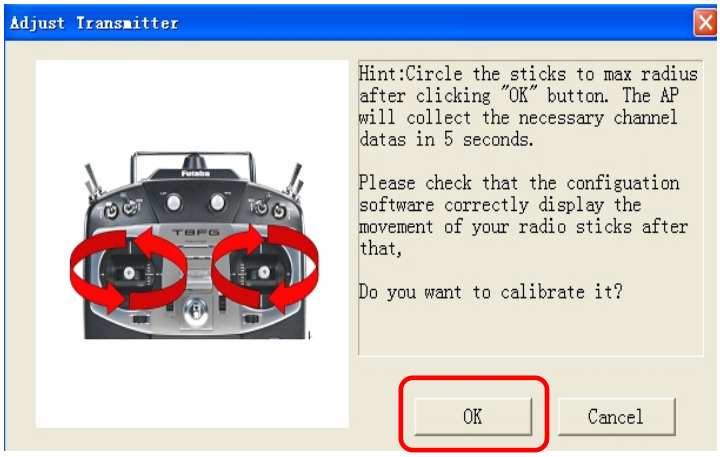




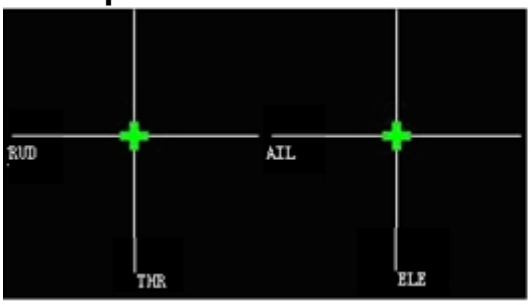
9) **Neutral position calibration – calibrate your Tx stick neutral position during new installation & every time you change to a new Rx. Press 'Adjust Transmitter':**

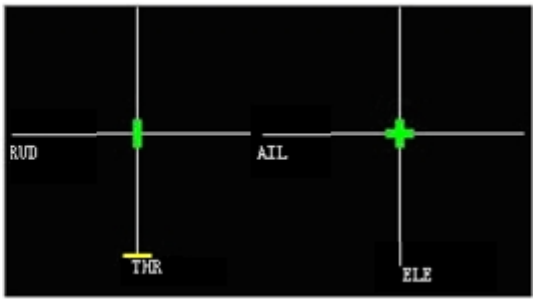


10) **The 'Adjust Transmitter' window will appear. Click 'OK' & move your transmitter stick <u>within 5 Seconds</u> to their maximum positions as shown in the diagramme:**



11) **The YS-S4 will automatically record your maximum & minimum stick position value of each channel. Confirm this by observing the stick position at mid point shows a GREEN:**





Note that for THR, the slider is YELLOW if the stick is at bottom & BLUE at hover position (normally near the middle position).

12) **Repeat 'Adjust Transmitter' if the sliders fail to show GREEN at mid position.**

13) **NOTE: If your aircraft cannot hover well after trim adjustments, repeat 'Adjust Transmitter' procedure.**

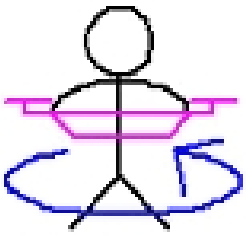
CALIBRATE THE MAGNETIC FIELD

a) **For new setups & every time a new hardware is installed onboard, a magnetic calibration should be done.**

b) ALWAYS carry out this calibration outdoors, far away from metallic objects (cars, radio towers, power lines etc.).

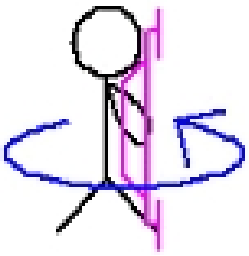
Step 1 – Move CH5 & CH6 to Position 1 (Stabilization Mode).

Step 2 – Move switch CH5 three times quickly between Position 1 & Position 2. The LED will flash BLUE all the time. You have entered Horizontal Calibration.



Step 3 – Carefully rotate your aircraft horizontally three times. ENSURE that the BLUE LED light remains ON during this procedure. If it turns OFF, that means the aircraft is not horizontal. Adjust the position until the BLUE LED is back ON & continue with the rotation.

Step 4 – After completing Horizontal Calibration, again move CH5 switch 3 times to enter Vertical Calibration. Point the Aircraft head downwards & observe the LED light. It should be BLUE all the time.



Step 5 – Carefully rotate the aircraft 3 times as shown above, always keeping the head down. Ensure the BLUE LED remains ON during the turn. If you tilt the aircraft beyond 3 degrees, the LED will turn OFF. Adjust position until the BLUE LED is back ON & continue with the rotation.

Step 6 – After completing above, place the aircraft on the ground & move CH5 switch quickly 3 times. The YS-S4 will enter the magnetic recording, & the LED will now flash PURPLE. Calibration is complete when the PURPLE flash turns OFF.

ESC/MOTOR ARMING PROCEDURE

a) **FAILSAFE: for safety, the YS-S4 will only arm the ESCs only AFTER you have tested the Failsafe function of your aircraft. Procedure:**
   i) **Set your failsafe as previously explained (see Radio Transmitter Setting).**
   ii) **Test the failsafe function, confirmed by observing PC software 'Flight Status' display change to 'Return & Land' after you switch OFF your RC Tx.**
   iii) **Carry out the above at least once for YS-S4 to allow ESC arming.**

iv) **Enable Combined-Stick-Command (CSC) for ESC arming.**

b) **To arm & activate your multirotor ESCs, you need to execute CSC as shown below:**

OR

c) **After the CSC operation, push the THR stick slightly up. The motors should begin to turn. If you do not push the stick in 5 seconds after doing the CSC, you need to redo the CSC to re-arm the ESC / Motors.**

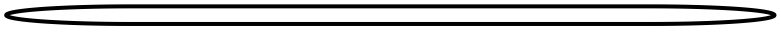
d) **During flight, motors will not stop immediately if you land in Auto Hover (GPS mode). This is why it is best to return to Stabilization Mode for landing.**

e) **WARNING: While actively flying in Stabilization Mode, NEVER move your THR stick to the bottom. The aircraft will crash!**

YS-S4 LED FLASHING INDICATOR

1) **The LED light will indicate the flight modes of the YS-S4 & other setting**

functions.

FUNCTION	INDICATOR			
	<5 satellites detected	5 satellites detected	6 satellites detected	GPS lock (>7 Satellites)
GPS Location				
Stabilized Mode with stick input				
Stabilized Mode				
GPS Mode				
GPS Mode with stick input				
Attitude deviation too big (poor stabilization)	Continuous White flashing			
Abnormal GPS signal	 Continuous White flashing			
Low battery warning	(2 seconds RED)			
Magnetic Calibration	(2 seconds BLUE)			
Recording Magnetic Data	(2 seconds PURPLE)			

2) WARNING: Take off only after 7 GPS satellites are located (Red LED flashing turns off). This ensures Home point is recorded & the aircraft can safely RTH.

3) WHITE LIGHT FLASHING

a) The WHITE LED flash means there is severe attitude deviation during flight resulting in poor stability. Stabilize the flight & the white flash should disappear.

b) If the WHITE LED flash continue even after stable flight is restored, this indicates GPS signal abnormality. Land the aircraft & check your GPS connection (inspect the wires, plug condition, looseness, etc.). If the

issue is solved, the white LED will disappear.

4) LOW BATTERY WARNING

a) The RED LED will flash in high frequency when the battery is low.

b) The RED LED will flash longer (2 seconds ON & 1 second OFF) when the battery level is very low.

NOTE ON FLYING MODES

1. STABILIZED MODE

a) In this mode, the aircraft will fly normally and stabilized in 3 axis.

b) YS-S4 flight characteristic is stable calm flights. Do Not fly fast, violent flights with large stick inputs when using this controller.

c) When flying in Stabilized Mode, never bring the THR stick to bottom. Doing this will result in the motors stop spinning and you will crash.

2. AUTO HOVER

a) In this mode, the aircraft will hold the position and altitude.

b) Your Tx sticks should all be in mid position, including your THR stick.

c) You can still fly the aircraft as normally via stick input, the moment the stick is released to mid position, the Auto Hover will resume.

d) SEMI-AUTO LAUNCH – using Auto Hover Mode, you can Semi Auto Launch:

i) While still on the ground and 7 satellites are confirmed, activate Auto Hover.

ii) Arm the motors and push the THR stick up around mid position.

iii) The craft will automatically lift off and climb to 2-3 meter altitude and hold hover waiting for your next input.

3. RETURN & LAND

a) In the Return and Land mode, the craft will RTL and land automatically.

b) You may take over the controls at anytime by changing to Stabilized Mode.

c) IMPORTANT: If you move from RTL to Auto Hover Mode, the aircraft will continue with the RTL & Land process.

d) On arrival at 'Home', the YS-S4 will begin to descend. At this time, the autopilot will allow you to take control of AIL & RUD to adjust the landing site. But THR remains fully autonomous during this decent & land.

e) After landing the motors will stop. Move your THR stick to bottom before changing back Stabilized Mode.

f) Altitude: If the craft is below 20m, the YS-S4 will ascend to 20m before initiating RTH. If the height is higher than 20m, altitude is maintained during RTH.

g) Safety 1: Since RTH is fully autonomous and you cannot alter the flight path during RTH, it is not advisable to activate RTH too close to you or spectators.

h) Safety 2: To avoid sudden lost in altitude, THR stick should be above mid-point when you change from RTH to Stabilized Mode.

4. Maximum Altitude and Distance Limit

a) The YS-S4 allows a maximum flight altitude of 100 meters and a maximum flight distance (radius) of 300 meters.

b) No matter what mode you fly in, if the aircraft exceeds the maximum limits,

RTH & Land Mode will be activated. You will not have control over the aircraft.

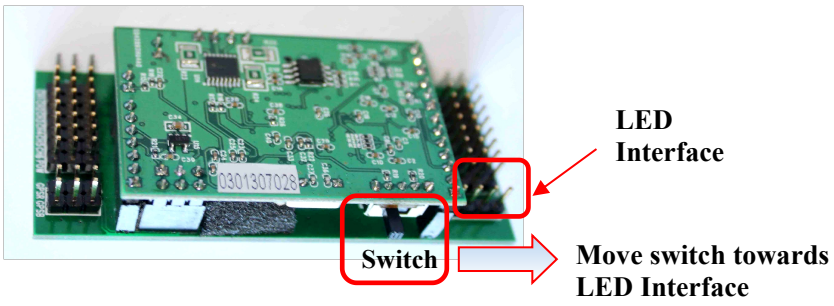
c) Once the aircraft returns within the range limit, RC control will be returned.

d) Note the altitude limit is relative. Example, if the craft was launched at 100 meters above sea level, the range limit is another 100 meters above that point.

FIRMWARE UPGRADE PROCEDURE

1) Note: Mini USB is not supplied. This cable can be found in most computer stores.

2) You may download the latest firmware from the ZeroUAV website.



3) For firmware upgrade, push the switch towards the LED interface.

4) Power the YS-S4. The LED will flash white light, which then turns OFF indicating it is ready for firmware upgrade.

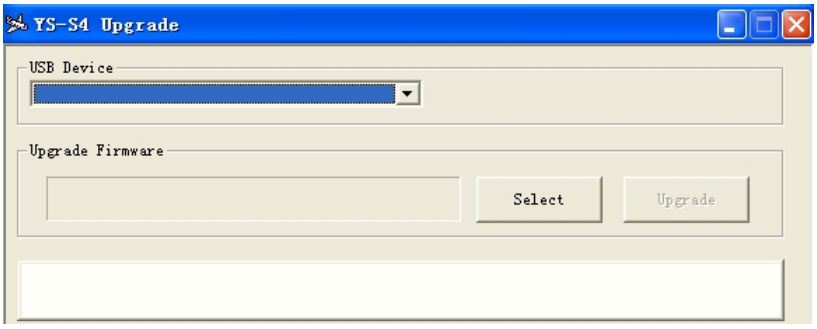
5) **Connect the YS-S4 to the computer via the mini USB.**

6) **Should your computer require the USB driver, find the program in the 'Driver' folder in the root of the configuration software:**

7) **Your computer antivirus may interfere with the ZeroUAV *.EXE programme. Temporarily disable this anti-virus protection (e.g. disable for 15 minutes).**

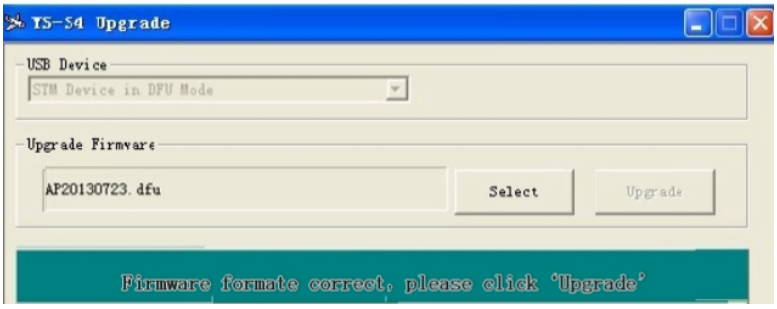
8) **Find the upgrade-S4.exe in the folder (eg:D:\YS-S4\Upgrade-S4) and open it:**

9) Click "select firmware file" button in the "YS-S4 firmware upgrade" window:

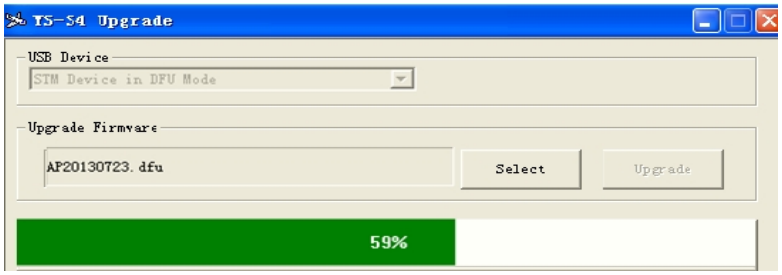


10)Select the needed firmware (eg: AP20130723.dfu).

11)Back to the main window of the Upgrade Software. Note: If there is no response, try another USB port.

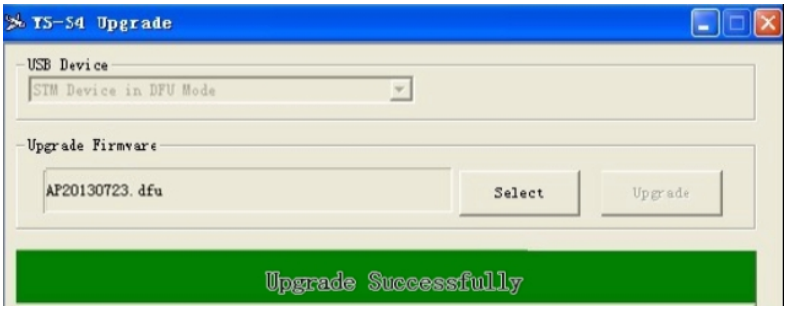


12)Double click at the "upgrade firmware" button.



13)Quit the firmware upgrade software after the system hints "upgrade successfully". Disconnect the USB cable, and push the dial switch back to the

side of the GPS interface. Test fly the aircraft.



End of Manual – Version 18 August 2013